

## Chapter 5. Fish Habitat Assessment

This chapter summarizes available information on the fish populations, stock status, and habitat conditions in WRIA 31. The information available regarding fish populations and habitat conditions in the WRIA is sparse.

The goals of this document are to provide:

- An overview of fish populations in WRIA 31;
- A review of any published WRIA 31 habitat studies; and
- An examination of the characteristic fish use of each of the streams where data are available.

WRIA 31 contains stocks of fall up river bright (URB) chinook, coho, summer steelhead, resident rainbow trout, and other native and introduced fish species.

### 5.1 Background

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WRIA 31 includes several tributaries to the Columbia River. The largest tributaries are (from west to east) Rock Creek, Chapman Creek, Wood Gulch Creek, Pine Creek, Alder Creek, Dead Canyon Creek, and Glade Creek.

WRIA 31 is underlain by Columbia River Basalts interbedded with sedimentary deposits (Section 2.3). In many areas, the bedrock is overlain by gravel sand, and silt deposited by glaciers or rivers. The eastern portion of the WRIA also has extensive wind blown sand and silt deposits (loess; Section 2.3). These deposits are fine grained and highly erodible. Most of the creeks originate on high plateaus and then run down long canyons before reaching the Columbia River.

Precipitation in the WRIA ranges on average from 8.2 to 16.2 inches per year (Section 2.5), decreasing from west to east. Most of the precipitation falls between October and May. Average maximum air temperature in Kennewick exceeds 90 degrees Fahrenheit in July and often reaches temperatures in excess of 100 degrees Fahrenheit. These precipitation and air temperature patterns have important influences on fish habitat.

Due to the low quantity of summer precipitation, natural stream flow is largely driven by groundwater inputs. Many of the streams in the area go dry or near dry in summer. The streams with negligible summer flow may have perennial pools fed by groundwater inputs that support fish. Summer flows in streams in the eastern portion of the WRIA may be influenced by runoff of irrigation water diverted from the Columbia River.

Water temperatures in most of the WRIA streams are higher than the Washington State criterion of 63.5 degrees Fahrenheit for streams containing salmon and trout. These temperatures are influenced by warm air temperatures and lack of flow. In some areas, water temperatures in pools may be cooled by groundwater inputs or subsurface flow.

The precipitation patterns also affect the type and condition of riparian vegetation along streams. Ponderosa Pine is found at higher elevations in many of the basins in the western portion of the WRIA. At lower elevations, riparian vegetation may include alder, black cottonwood, willow, Oregon white oak, and other shrubby vegetation. Black walnut, an introduced species, is also common.

## **5.2 Methods**

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This report is based on existing information contained in published reports supplemented by information provided by local residents and area biologists. Where possible, the text relies on actual published data. The published information was supplemented by a site reconnaissance survey and an interpretation of the information collected during surveys conducted by the General Land Office in the mid-1800s. Methods used are described below.

### **5.2.1 Existing Literature**

The fish distribution maps (Figure 5-1) were obtained from the Streamnet database ([www.streamnet.org](http://www.streamnet.org)). The Streamnet database draws its information on distribution largely from Washington Department of Fisheries, et al. (1993) but is updated with additional information. The database does not cite sources of information regarding distribution of fish. Natural fish passage barriers were identified through the review of literature, through direct observation, and through discussions with local residents.

Habitat condition data (published or otherwise publicly available) are virtually non-existent for this WRIA. Additionally, there has been no assessment of the effects of land management on fisheries habitat in the WRIA. The Washington State Conservation Commission Salmonid Habitat Limiting Factors, Final Report; WRIA 31 (Lautz 2000) provides some general descriptions of habitat conditions for some of the basins but provides little data and few citations to published information. This is largely due to the general lack of information regarding fish habitat in the area. The document draws largely on professional opinion of local biologists. These comments also extend to the Draft Klickitat Subbasin Summary (Berg et al. 2001), again due to the lack of available information.

### **5.2.2 Reconnaissance Survey**

In order to supplement the available information, a reconnaissance survey was conducted of the Rock Creek, Chapman Creek, and Wood Gulch basins. Local residents assisted with this survey, providing access and accompanying the authors. Most of these basins are privately owned and the assistance of the local residents was invaluable. No specific data were collected during this reconnaissance survey; however, the survey did provide an opportunity to evaluate general conditions and watershed processes in the basins as well as an understanding of the history and management of the basins.

**Table 5-1. Summary of Applicable Fisheries Reports**

<b>Author, Year</b>	<b>Title</b>	<b>Content Review</b>
Bureau of Land Management (BLM). 1985.	Field exam of Rock Creek, Klickitat County. Memorandum to Wenatchee Area Manager. November 4, 1985.	Summary of fish survey data in Rock Creek
Bureau of Land Management (BLM). 1986.	Summary of Rock Creek Stream Survey, May 20, 1986 by Art Oakley, State Office Fishery Biologist	Summary of fish survey data in Rock Creek
Novotny, Jerry F., Thomas L. Macy, and James T. Gardenier, William R. Nelson, Curtis L. Burley. 1985a.	Pen Rearing And Imprinting Of Fall Chinook Salmon Annual Report 1984, Report to Bonneville Power Administration, Contract No. 1983BP13084, Project No. 198331300,	Report on net pen rearing experiment conducted at the mouth of Rock Creek.
Novotny, Jerry, Thomas L. Macy, James T. Gardenier - U.S. Fish and Wildlife Service. 1985b.	Pen Rearing and Imprinting of Fall Chinook Salmon, Final Report 1985b, Report to Bonneville Power Administration, Contract No. 1984BP13084, Project No. 198331300, 72 electronic pages (BPA Report DOE/BP-13084-2).	Report on net pen rearing experiment conducted at the mouth of Rock Creek.
Novotny, Jerry F, Thomas L. Macy, James T. Gardenier, and John W. Beeman. 1986.	Pen Rearing and Imprinting of Fall Chinook Salmon, 1986. Annual Report, 1986, Report to Bonneville Power Administration, Contract No. 1983BP13084, Project No. 198331300, 87 electronic pages (BPA Report DOE/BP-13084-3)	Report on net pen rearing experiment conducted at the mouth of Rock Creek.
Washington Department of Fisheries, Washington Department of Wildlife, Western Washington Treaty Indian Tribes. 1993.	1992 Washington State Salmon and Steelhead Stock Inventory. Washington Department of Fish and Wildlife. Olympia, WA.	Summary of information regarding the distribution and status of species in the WRIA
Beeman, John W. and Novotny, Jerry F. 1990.	Pen Rearing and Imprinting of Fall Chinook Salmon, Annual Report 1989 to Bonneville Power Administration, Portland, OR, Contract 83-AI-13084	Report on net pen rearing experiment conducted at the mouth of Rock Creek.
Paul Wagner. 2000.	Fish Survey of Dead Canyon Creek, completion report (note: <i>report not actually attained yet, will arrive in a few days; information currently cited as personal communication. This chapter will be updated when the report arrives.</i> )	Summary of electrofishing and snorkeling data collected in Dead Canyon Creek.
Berg, L, T. Bachman, W. Conley, F. Dobler, J. Matthews, and B. Sharp. 2001.	Draft Rock Creek Subbasin Summary. Prepared for the Northwest Power Planning Council.	Summary of available information plus descriptions of habitat and land use effects (little basin specific information cited).

Author, Year	Title	Content Review
Lautz, Kevin. 2000.	Salmon and steelhead habitat limiting factors, Water Resource Inventory Area 31. Washington State Conservation Commission.	Summary of available information plus descriptions of habitat and land use effects (little basin specific information cited).
Northwest Power and Conservation Council. 2004.	Lower Middle Mainstem Including Rock Creek Subbasin Plan. Draft.	Summary of available information plus discussion of presumed land use effects.

### 5.2.3 Review of Historical Records

In the mid-1800s, the General Land Office (GLO) contracted the survey of all townships, ranges, and sections in much of the western United States, including WRIA 31. The surveys were done in two parts. The boundaries of the townships were surveyed first. The interior section lines of the township were surveyed if the information collected by the boundary surveyors indicated there was value in conducting the interior surveys. All townships in WRIA 31 had both the township boundaries and the section lines surveyed.

The primary purpose of the surveys was to mark township and section lines on the landscape; hence the majority of the survey notes are focused on survey details. The surveyors also took detailed notes on available water, vegetation, and soils to help assess the potential for settlement of the surveyed areas. These notes included details on vegetation, location, size, and depth of streams, presence of dry channels, locations of ravines, locations of any existing homes, fields, and fences, and general information on the soil characteristics. Soil was rated as 1<sup>st</sup>, 2<sup>nd</sup>, or 3<sup>rd</sup> rate (no description of these terms has been found) and additional notes were made regarding the soil characteristics from time to time (e.g. soils are rocky). Since the surveys followed section lines, notes on streams are limited to locations where the channels cross those section lines. As a result, information on streams is scattered across a grid and is not continuous.

All measurements except stream depth were taken in units of chains or links. For the purposes of this document, those measurements were converted to inches and feet. One link = 7.92 inches and 1 chain = 100 links or 66 feet.

The quality of the notes varied between surveyors; however all of the survey notes reviewed for WRIA 31 were completed by Edwin Richardson, A. H. Simmons, or Edward Giddings. Each of these men took very detailed notes. No description of the methods used was found; hence, some interpretation of the notes was necessary. In particular, there is some uncertainty whether stream widths were wetted widths or channel widths and whether “ravines” had water in them.

The surveyors frequently noted stream widths of channels that they indicated were dry. Both also regularly noted even minor water in channels. Therefore, it is inferred that the reported widths are channel widths. The presence or absence of water, however, is sometimes more difficult to interpret. Where the channel was specifically described as dry or containing water, the interpretation is simple; but, in many instances, a channel

width was given with no description of the presence or absence of water. In these cases, no inferences were made regarding presence or absence.

Interpretation of the term “ravine” was also problematic. Both surveyors noted numerous ravines and typically gave their depths. In many locations, the presence of a wetted or dry channel was noted. Channels were described primarily in the lower portions of each basin. In the upper basins, ravines were often described but no channel was mentioned. It is unclear whether these ravines had channels in them. Since these ravines with no mention of a channel were typically found upstream of dry channels and the surveyors tended to be very complete in their description of water, we have assumed that they were also dry. This, however, cannot be confirmed or denied.

The survey notes are available on microfiche at the University of Washington. The notes for most of Rock Creek and the lower portions of the other major streams were gathered and reviewed. Specific locations, surveyors, and survey dates of the reviewed notes are detailed in Table 5-2. Most of Rock Creek and the upper portions of Wood Gulch were surveyed in late summer or early fall. These surveys represent conditions in the dry season. Lower Chapman Creek was surveyed in April and all other areas reviewed were surveyed in June. These spring and early summer surveys represent conditions during wetter periods of the year.

The amount of rainfall in the years that the surveys were conducted is unknown. No monitoring of climate was done in the area in 1867 and 1868. Garfin and Hughes (1996) have reconstructed a drought index for the period extending from 1840 through 2003 using tree ring analysis. The drought index is designed such that a value of 0.0 indicates an average year. The estimated drought indices for the years 1867 and 1868 were 0.912 and 2.009 respectively. Sixty-six (66) percent of the years between 1840 and 2003 were estimated to be drier than 1867 and 81 percent of those years were estimated to be drier than 1868. Hence, 1867 was just a little wetter than average and 1868 was a rather wet year. Based on this analysis, lower Chapman Creek, upper Wood Gulch, and the eastern portion of Rock Creek, including Squaw Creek, were all surveyed on unusually wet years. The rest of the townships were surveyed in years that were slightly wetter than average. Drought years are not represented in the notes.

**Table 5-2. Locations, Primary Surveyor, and Survey Dates of General Land Office (GLO) Notes Reviewed**

<b>Township and Range</b>	<b>Location Description</b>	<b>Township Boundary or Section Lines</b>	<b>Surveyor</b>	<b>Date(s)</b>
T3 R19	Lower Rock Creek to the pipeline crossing and portions of Chapman Creek	Section lines	Edwin Richardson (Richardson 1867)	November 19, 1867
		North and west boundaries	A. H. Simmons (Simmons 1867a)	September 7, 1867
T3 R20	Lower Chapman Creek to one mile east of Beeks Road and lower Old Lady Canyon to ½ mile north of the old 8 Road	Section lines	Edwin Richardson (Richardson 1868)	April 2, 1868
		North and west boundaries	Edward Giddings (Giddings 1867)	June 25, 1867
T3 R21	Lower 2+ miles of Wood Gulch	Section lines	Edward Giddings (Giddings 1867)	June 19-24, 1867
		West and north boundaries	Edward Giddings (Giddings 1867)	June 21-24, 1867
T4 R18	Rock Creek from 1 miles upstream of confluence with Squaw Creek to 1.5 miles downstream of confluence with Quartz Creek, and Luna Gulch to Oak Flat Road	Section lines	A.H. Simmons (Simmons 1867b)	September 24 – October 7, 1867
		North and west boundary	A. H. Simmons (Simmons 1867a)	November 14, 1867
T4 R19	Rock Creek from pipeline northwest roughly 2 river miles, the lower 2 miles of Squaw Creek, and portions of Squaw Creek and White Creek downhill from Newell Road. Upper Chapman Creek.	Section lines	Edwin Richardson (Richardson 1869)	September 29-October 2, 1868
		North and west boundaries	A.H. Simmons (Simmons 1867a)	September 6-7, 1867
T4 R20	Wood Gulch just upstream of the confluence with Big Horn Canyon	Section lines	Edwin Richardson (Richardson, 1869)	August 14-25, 1868
		West boundary	Edward Giddings (Giddings 1867)	June 24, 1867
T4 R21	Upper Pine Creek and portions of Wood Gulch	West and north boundaries	Edward Giddings (Giddings 1867)	June 21-24, 1867
T4 R22	Six Prong Creek	Section lines	Edward Giddings (Giddings 1867)	June 13-17, 1867

Township and Range	Location Description	Township Boundary or Section Lines	Surveyor	Date(s)
	upstream from Peterson Road, lower 2 miles of Pine Creek	West boundary	Edward Giddings (Giddings 1867)	June 12, 1867
T4 R23	Lower Alder Creek to Peterson Road	Section lines	Edward Giddings (Giddings 1867)	June 6-11, 1867
		East and west boundaries	Edward Giddings (Giddings 1867)	June 4, 1867

### 5.3 Hatchery Operations

Currently, fish populations in WRIA 31 are not supplemented with hatchery fish. Supplementation has apparently been limited to an experimental program conducted in 1984 through 1986. Juvenile upriver bright fall chinook from the Spring Creek National Fish Hatchery were reared for one to two months in net pens at the mouth of Rock Creek (Novotny et al. 1985a; Novotny et al. 1985b; Novotny et al. 1986; Beeman, et al. 1990). Fish were tagged prior to release and returns of fish in ocean fisheries, in the Columbia River, and at the release site were documented in subsequent years. Overall, returns were low from these releases (Table 5-3).

**Table 5-3. Tagged Fish Returns, 1984-1986**

Year of Release	Number Released (not all were marked)	Number of Tagged Returns <sup>4</sup>	Adjusted Total Returns (%) <sup>4</sup>
1984	56,748 <sup>1</sup>	424	0.973
1985	232,962 <sup>2</sup>	1570	0.910
1986	620,204 <sup>3</sup>	N/A <sup>5</sup>	

1/ Novotny et al. 1985a

2/ Novotny et al. 1985b

3/ Novotny et al. 1986

4/ Beeman et al. 1990

5/ At the time of the final report, only a few preliminary returns were reported.

### 5.4 Fish Distribution, Stock Status, and Population Trends

Three species of anadromous salmon, fall chinook (*Onchorynchus tshawytscha*), coho (*Onchorynchus kisutch*), and summer steelhead (*Onchorynchus mykiss*), are found in WRIA 31. Summer steelhead has been identified as indigenous to the subbasin. The remaining anadromous use is believed to be a result of straying of other mid-Columbia stocks, or is incidental use associated with upriver migration of adults or downriver migration of juveniles (Berg et al. 2001). Pacific lamprey (*Entosphenus tridentatus*), suckers (*Catostomus spp*), dace (*Rhinicthys spp*), and other non-game fish species have also been observed in the basin (Berg et al. 2001; Paul Wagner, personal communication, July 21, 2004; Carl Dugger, personal communication July 2004).

### 5.4.1 Data Sources

Data sources regarding fish distribution in WRIA 31 are sparse. Data regarding stock status and/or population trends are non-existent. Fish species reported in the WRIA are based primarily on observations of local residents and fish biologists working in the area. The lower two miles of Dead Canyon Creek were surveyed using electroshocking and snorkeling methods in 2000 or 2001 in support of an Environmental Assessment (Paul Wagner, KWA, Inc., personal communication, July 20, 2004). Dace, 3-spine sticklebacks, and sculpin were found in that survey. Surveys were also done in upper Rock Creek (BLM 1985, 1986). Some limited redd surveys have reportedly been completed by the Yakama Nation in Rock Creek in 2002, 2003, and 2004. These surveys were done with single passes in each reach. Only the lower 3 miles of the mainstem were surveyed in all years (Northwest Power and Conservation Council 2004). Details of survey methods, survey locations, and survey results are not available. WDFW intends to conduct spawner surveys and electroshocking surveys in Glade and Alder Creeks, and possibly some other tributaries in the WRIA (Paul Hoffarth, personal communication, July 20, 2004). This work will most likely be conducted in 2005.

### 5.4.2 Steelhead

#### Distribution

The stock of summer steelhead present in WRIA 31 is considered part of the Mid-Columbia Evolutionarily Significant Unit (ESU) for steelhead, which has been listed as “threatened” under the Endangered Species Act (NMFS 1996). Summer steelhead are known to occur in Rock Creek up to a point 1/4 mile above the confluence with Quartz Creek (BLM 1985; BLM 1986); additional utilization may occur above this point. Steelhead have also been found in lower Quartz Creek (BLM 1985; BLM 1986) and are reportedly found in Squaw Creek up to the confluence with Harrison Creek (<http://www.ecy.wa.gov/services/gis/maps/wria/sasi/sasipdf.htm>). The source for the information regarding Squaw Creek is unknown.

The summer steelhead in Rock Creek are considered indigenous. The population is sustained through natural reproduction and there is no record of stocking in this basin.

The Yakama Nation conducted sporadic spawner surveys in 2002, 2003, and 2004. They indicated that the greatest density of spawners was observed in the lower five miles of Rock Creek, where 34 to 45 redds per mile were observed (Northwest Power and Conservation Council 2004). The surveys were not conducted across all potential habitat and were not repeated over the season in all areas, hence the reported number of redds is likely underestimated. The 1992 SASSI report (Washington Department of Fisheries et al. 1993) indicated that the status of the Rock Creek population is unknown.

In addition to Rock Creek, steelhead have also been mapped in the lower reach (approximately 0.3 miles) of Chapman Creek (<http://www.streamnet.org>) and Wood Gulch Creek (<http://www.streamnet.org>; Carl Dugger, personal Communication, July 2004) (Figure 5-1). Carl Dugger (WDFW) reported seeing juvenile of steelhead or rainbow trout in the lower Chapman Creek (Lautz 2000). Steelhead have erroneously been reported in Glade Creek as well, but these fish were apparently resident rainbows (Brett Barkdull, personal communication, July 22, 2002). Dead Canyon was surveyed for